Technical English, Lecture 13:

Writing a paper and a thesis

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Why and how do we provide our results?

The output of a researcher is recognized in two major ways

- a working prototype that may lead to a real product later and

- descriptions of the research steps undertaken.

In some fields, the basic research does not lead directly to a prototype. It is only after the accumulation of several years of research that a working system is produced.

Do I have what I need?

To conduct research a student must

- have a good command of the language used in the field (English, Mathematics, Terminology);

- have a strong background and review most of the relevant literature (long and short documents serve different purposes);

- follow a logical way of thinking based on proofs and sound debates seldom on conjectures or unfounded speech and definitely not on fallacious sophistry; and

- present the matter objectively.

Objectivity does not erase the student's personality. The environment in which a student lives and his or her own way of thinking affect, at least, the choice of the topic and the approach to solve it.

Useful terminology

A theorem is a major result, one of the main goals of the work. Use this term sparingly.

A proposition is a minor yet interesting result with relative importance.

A corollary is a minor result with less importance and it is derived with little proof from a theorem.
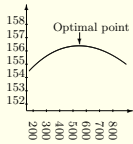
A lemma is a simple subsidiary statement that is stated and proved before being used to prove a theorem.

Data objectivity

The results of a simulation or an experimental work is often presented as a graph. Be honest while drawing.

- Do not fit the data to your preconceived arguments. You should rather explain your findings and why they might be deviating from your expectations.

- Do not over-glorify your findings. Will this result appear so "optimal" if both axes start at zero with the same scale?

Paper and thesis: common traits

A research paper and a research thesis share many things in their structure.

1. Introduction.

2. Literature survey.

3. Problem details.

4. Proposed solutions.

5. Verification of these proposals (simulations and experiments).

6. Comparative study of the results in light of previous methods.

7. Conclusions, recommendations, and a summary of contributions.

8. Future work.

9. References.

10. Appendices.

Paper and thesis: differences

Due to their purposes, they differ at least in their

- length,

- amount of details provided, and

- focus.

The thesis may have an acknowledgment section while the paper may have a number of distinguishing keywords.

What do the readers expect?

There are a few questions that a reader should be able to answer.

- What is the research question?

- Is it a worthy problem?

- Is the answer provided in the document adequate?

- Is it an adequate contribution (according to the level of the document)?

Getting started

A simple yet very useful way to write your thesis is to

- make short summaries of all the previous research work *while you are in the "reading phase"*, then

- prepare a general outline of your work,

- add section and subsection titles,

- write the main points that you will discuss in each subsection, and

- review that outline while filling more details over time.

Time-line

It takes *longer* than what you expect to finish writing a *good* paper or a thesis. When you write

- you formalize your ideas and you discover weaknesses or mistakes in some arguments;

- you present the document to others (professors or reviewers) and they tell you about many shortcomings; and

- you may find out that you have a problem in conveying your ideas clearly which leads you to multiple revisions.

Revisions

- Re-visions are meant to be yet another iteration through the text.

- They are more effective when you have distanced yourself from that piece of text for some time. You come back with a fresh eye.

- Revisions are not just proofreading. They are supposed to enhance the presentation of the arguments and to strengthen any weaknesses or correct any mistakes (in the language or in the thoughts).

Beyond the text

- Produce high quality graphics. Keep the original drawings and not just the output format.

- Use tools that generate vector graphics and not bitmaps as much as possible.

- Choose the thickness of the lines in anticipation of any size scaling that might occur while printing.

- Use colors with caution. You might opt to have two versions of your figures.

- Use distinguishable symbols in your legends and legible fonts for your labels.

- Do not compress the files of your illustrations with a lossy compression technique.

Conclusions

- Start early.

- Make short summaries of what you read.

- Document your research steps.

- Use good tools.